Undernutrition in Children Under-two years (U2) in India – An Analysis of Determinants

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Abstract

The third National Health and Family Health Survey, 2005-06 (NFHS 3), India reports that almost every second child is undernourished. Overcoming undernutrition is critical not only to meet the first Millennium Development Goal (MDG) to halve poverty and hunger but to achieve the other MDG goals pertaining to maternal health, child survival, HIV/AIDS, education and gender equity. In India, the data on trend in undernutrition in the last decade in the country is not available despite the introduction of the National Health Surveys since 1992. This is primarily due to the fact that a standard criterion has also not been used for classification of undernutrition in the national surveys. Therefore, there is a need to convert the available data of the various national nutrition surveys to a specific age group and then study the trend and associations of the prevalence rate of undernutrition. With this aim the present paper is written with the objective to estimate the prevalence of undernutrition (underweight and stunting) in children below two years in India and to study the factors contributing significantly to undernutrition. The raw data of second and third round of National Family Health Survey (NFHS) are used for comparing the prevalence of undernutrition in children. Logistic regression model has been used as the statistical method to analyze the data examining significant association between level of malnutrition and selected risk factors. The finding shows that low status of women (in terms of health, nutrition, education, decision making ability) is one of the primary cause which adversely influence the nutritional status of children. Significant association of under nutrition in children has been observed with low birth weight, factors which influence the health, nutrition and social status of women. These findings advocate the need to focus on life cycle approach for improving nutritional status of young children.

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1.   Introduction

Worldwide three-quarter of child deaths are due to malnutrition. The underlying causes include access to food, maternal health, child care and hygiene-sanitation practices. So

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overcoming undernutrition is critical to not only to meet the first Millennium Development Goal (MDG) – to halve poverty and hunger but also to achieve the other MDG goals pertaining to maternal health, child survival, education and gender equity. There is, however, a complex interplay of various factors related to access and availability of quality of food, feeding practices, mother's education, availability of maternal and child health services, safe water, sanitation, status of women in the society etc which influence nutritional status of children[1]. It is therefore important to examine various factors of undernutrition and their association to nutritional status of children so that the role of non-food factors in contributing to undernutrition is well understood and appreciated. It is also essential for the development of strategy to address undernutrition and for ensuring that high political and bureaucratic priority is accorded to factors other than mere supply of food in form of food supplements to women and children for reducing undernutrition.

India has entered the 21st century with a supportive policy framework to tackle its immense malnutrition problem with effective implementation of several ongoing programs for reducing undernutrition. The two primary programmes being Integrated Child Development Services (ICDS) Scheme and the Reproductive Child Health programme of the Health sector.

The third National Health and Family Health Survey (NFHS 3), 2005-6 of India reports that almost every second child is undernourished. Overcoming undernutrition is critical not only to meet the first Millennium Development Goal (MDG) – to halve poverty and hunger but to achieve the other MDG goals pertaining to maternal health, child survival, HIV / AIDS, education and gender equity.

In India, the data on trend in undernutrition in the last decade in the country is not available despite the introduction of the National Health Surveys since 1992. This is primarily due to the fact that nutritional status has been assessed not for a single uniform age group but for different age groups of children in the three major national surveys or NFHS 1, 2 and 3.   A standard criterion has also not been used for classification of undernutrition in the national surveys. There is a need to convert the available data of the various national nutrition surveys to a specific age group and a standard classification of undernutrition for assessing the trend and the significance of the shift in the prevalence rate of underweight, stunting and wasting.

Moreover, earlier state survey report and NFHS 3 data indicate that the prevalence of undernutrition continues to rise up to two years of age and then more or less stabilizes.[2, 3, 4] It is evident that the first two years of life is the most critical period for actions to prevent undernutrition in children. Also the prevalence of wasting is only 26% as compared to the figure of around 40% for underweight and stunting for the age group under 2 years..

Hence, the current study aims to (1) estimate the prevalence of undernutrition (underweight and stunting) in children below two years in India in 1998-99 and 2005-06, and (2) study the association of underweight and stunting in children below 2 years with various factors such as feeding practices, availability of health and nutrition services to mothers and young children and identify the risk factors.

2.   Data and Methodology

Undernutrition is a process, with consequences that may extend not only into later life, but also into future generations[10]. The process of becoming under-nourished often starts in uterus and may last, particularly for girls and women, throughout the life cycle. It also spans generations. A stunted girl is likely to become a stunted adolescent and later a stunted woman. Besides posing threats to her own health and productivity, poor nutrition that contributes to stunting and underweight in her adult life increases the chance that her children will be born under-nourished. And so the cycle turns.   And we need to tackle the problem of undernutrition by the life cycle approach, making corrective measures at each and every stage of our life span.

The study uses data from National Health Family Survey, 2005-06 (NFHS-3) for assessing the nutritional status of children below two years. For studying the prevalence of undernutrition in children under-two years, two standard indices of nutritional status, i.e., underweight (weight-for-age) and stunting (Height for age) were assessed using the WHO reference standards for the South East Asia. The WHO Multicenter Growth Reference Study provides the standards for weight for age, height for age and weight for height for different ages and sexes.[5, 6, 7] The classification of nutritional deficiency for the children was derived as under nutrition

- o Moderate – within -2SD to -3SD of the WHO reference standard.
- o Severe - < -3SD of the WHO reference standards
- o Total < -2SD of the WHO reference standards

The association of undernutrition in children below two years with non-food determinants was studied. The data were also used for comparing the prevalence of undernutrition in children under-two years of age. Month-wise trend in undernutrition (underweight and stunting) were analyzed for under- fives. The SPSS (Statistical Package for Social Sciences) package has been used for the statistical analysis. Pearson's chi-square test of independence was used to test the existence of significant association between level of malnutrition and selected risk factors. The significant variables (p-value<0.05) observed in bivariate analysis were subsequently included in multivariate analysis. A linear logistic regression analysis has been used for multivariate analysis. The various possible risk factors studied in the analysis are as under.

Infants and Young Child feeding practices
- Children breastfed within one hour of birth
- Complementary feeding practice
- Infant and Young Child Feeding Practices
- Feeding practices during diarrhoea

Nutritional status of mother and birth parameters
- Women married by age 18
- Height of mother below 145 cm
- Body Mass Index (BMI) of Women
- Median age at first birth
- Age at marriage
- Low birth-weight(LBW)
- Birth interval
- Anemia

- Education status
- Domestic violence
- Exposure to mass media--watching television
- Exposure to mass media--listening radio

Environment Factors
- Toilet facility
- Safe drinking water
- Standard of living

Health services
- Immunization
- ANC check ups
- Institutional births
- Consumption of IFA tablets

ICDS services
- Supplementary food
- Weighing of children
- Health check ups
- Health and nutrition education

3.   Results

3.1   Prevalence of undernutrition in children under 2 years (U2)

Underweight:
The prevalence rate of underweight in India is 38.7% with severe cases being 14.9%.
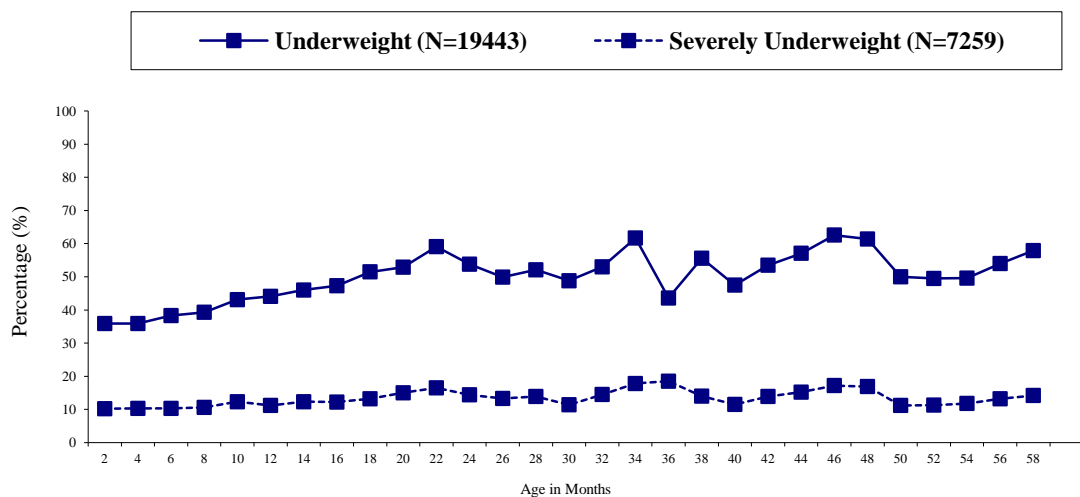

Figure 1: Month wise prevalence of underweight and severe underweight in children in India

In fact the prevalence of underweight has increased from 37.2% during the period of NFHS2 (1998-99) to 38.7% during the period of NFHS3 (2005-06). *Fig 1 shows the month-wise underweight among the children of age 5 and less. The* Month-wise underweight

prevalence shows a continuous increase in the first 24 months.   And afterword it hover around 40%.

The differentials show that prevalence of underweight is higher in rural areas.   Further highest among the tribal children and among the poorest people.
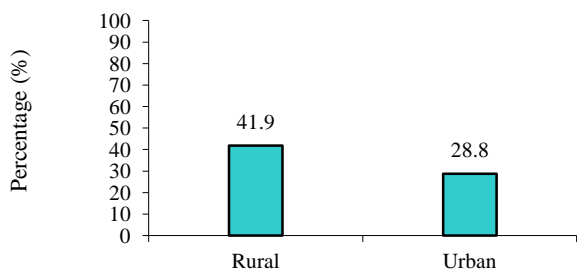

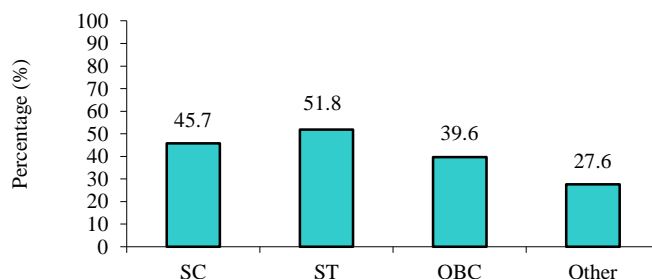**Figure 2: Prevalence of underweight in children < 2 years by residence**

Figure 3: Prevalence of underweight in children < 2 years by caste
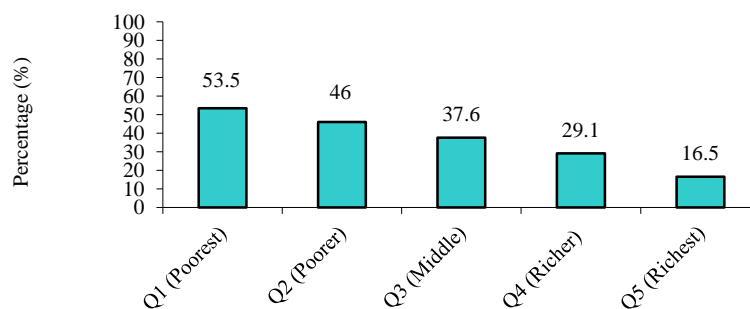

Figure 4: Prevalence of underweight in children < 2 years by wealth index*

Stunting:

Stunting prevalence rates increase with increase in age and the highest prevalence rate is by two years of age.   About a third of under-two years children are observed to be stunted by two months of age. The data of NFHS 2 and NFHS 3 for stunting among under-two years indicates a substantial decrease which is statistically significant, a decrease from 49.5% in 1998-99 to 40.2% in 2005-06.
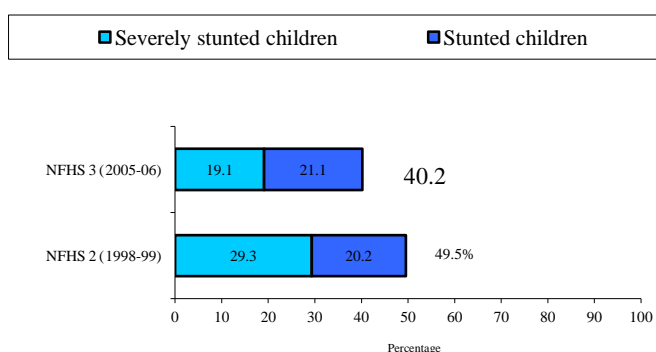

Figure 5: Trends (1998 - 2005) in Stunting-U2

The differentials show that prevalence of stunting is higher in rural areas. Further highest among the SC/ST children and among the poorest people.
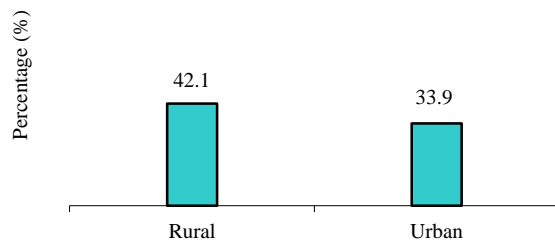

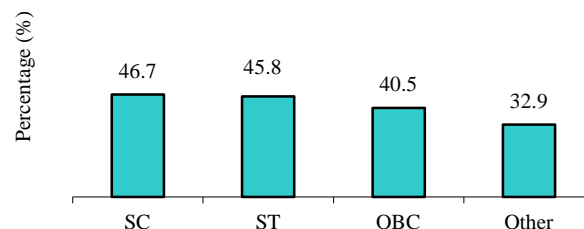**Figure 6: Prevalence of stunting in children < 2 years by residence**

Figure 7: Prevalence of stunting in children < 2 years by caste
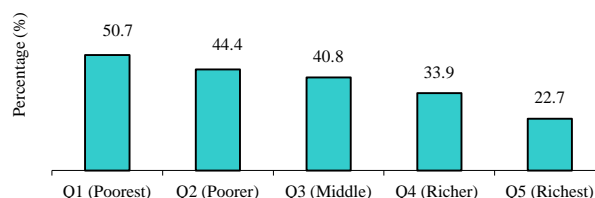
Figure 8: Prevalence of stunting in children < 2 years by wealth index*

3.2.   Undernutrition and risk factors

The univariate analysis reflects the effect of the various risk factors on the prevalence of underweight and stunting, withholding their confounding effect if any.

The birth weight of the children, colostrum feeding, complete immunization, measles immunization quality of drinking water, toilet facility, wealth index, age at marriage, height of mother, women's education, emotional violence, exposure to TV and radio, ANC checkups, institutional delivery, IFA tablets, children weighed at birth, health checkup, nutritional education and supplement food under the ICDS have significant effect on the weight for height.

Stunting among the children under 2 years of age was significantly affected by all the above factors except birth weight and health checkups and nutritional education under ICDS.

Table I: Underweight and Stunting across Various Risk Factors

Risk Factors		Underweight		Stunting	
		%	p-value	%	p-value
Birth Weight	Birth weight of child was < 2500 grams	39.2	<0.001	38.9	<0.001
	Birth weight of child was > 2500 grams	19.5		25.9	
Children given colostrums	Children given colostrum	38.3	<0.001	39.3	0.027
	Children not given colostrum	47.1		42.6	
Food during diarrhoea	Children with diarrhoea given more food	43.5	0.089	39.8	0.015
	Children with diarrhoea given less food	46.2		43.6	
Immunization among Male children	Male Children have been fully immunized	25.8	0.007	23.2	<0.001
	Male Children have not been fully immunized	27.4		25.3	
Immunization among Female children	Female Children have been fully immunized	26.6	0.271	23.3	<0.001
	Female Children have not been fully immunized	27.3		26.9	
Measles Immunization among Male children	Male Children have been immunized with measles vaccine	26.2	0.027	22.2	<0.001
	Male Children have not been immunized with measles vaccine	27.5		25.7	
Measles Immunization among Female children	Female Children have been immunized with measles vaccine	25.9	0.002	22.5	<0.001
	Female Children have not been immunized with measles vaccine	27.8		26.7	
Drinking Water in the Household	HH has improved source of drinking water	30.6	<0.001	35.6	<0.001
	HH does not have improved source of drinking water	43.3		43.5	
Toilet facility in the Household	HH has toilet facility	26.6	<0.001	31.6	<0.001
	HH does not have toilet facility	46.8		46.4	
Standard of Living of the households	HH with low standard of living	51.5	<0.001	50.4	<0.001
	HH with high standard of living	25.5		30.3	
Age at marriage	Woman married by age < 18	44.1	<0.001	44.5	<0.001
	Woman married by age > 18	31.2		33.9	
Height of mother	Height of mother below 145 cm	53.7	<0.001	54.9	<0.001
	Height of mother above 145 cm	36.1		38.1	
Birth Interval	Birth of children with less than 2 years interval	41.9	0.248	45	0.290
	Birth of children with more than 2 years interval	40.7		41.1	

Woman's Education	Woman is uneducated	48.8	<0.001	48.2	<0.001
	Woman has 1-4 years of education	43.2		42.8	
	Woman has 5-9 years of education	32.7		36.4	
	Woman has ≥ 10 years of education	19.9		22.7	
Emotional Violence	Woman has experienced emotional violence	48.5	<0.001	45.3	<0.001
	Woman has not experienced emotional violence	38.2		40.4	
Listen to radio	Woman who listens radio at least once a week	35	<0.001	36.4	<0.001
	Woman who doesn't listen radio at least once a week -No	40		41.4	
Listen to TV	Woman who watches TV at least once a week	28.1	<0.001	32.8	<0.001
	Woman who doesn't watch TV at least once a week	46.9		45.7	
3 ANC check ups	Mothers had 3 ANC check ups	30.1	<0.001	34	<0.001
	Mothers not had 3 ANC check ups	47.1		45.1	
Institutional Delivery	Mother had institutional delivery	27.8	<0.001	31.9	<0.001
	Mother had no institutional delivery	46.3		45.9	
IFA tablets	Mother has consumed IFA for 90 days or more	27.1	<0.001	31.4	<0.001
	Mother has not consumed IFA for 90 days or more	38.6		39.5	
Children weighed at birth	Children are weighed	44.5	0.006	43.3	0.854
	Children not weighed	40.6		43	
Health checkups under ICDS	Pregnant women received Health check ups	39	<0.001	40.7	0.131
	Pregnant women not received Health check ups	45.8		43.1	
Health and nutrition education under ICDS	Pregnant women received health and nutrition education	37.5	<0.001	39.4	0.007
	Pregnant women not received health and nutrition education	47		43.7	
Supplementary food for children under ICDS	Child received supplementary food	39.8	0.018	41.5	0.100
	Child did not receive supplementary food	43.5		44.1	
Supplementary food for mothers under ICDS	Pregnant women received supplementary food	44.2	0.091	41.6	0.983
	Pregnant women did not receive supplementary food	39.6		41.8	

3.3.   Undernutrition and risk factors: Multivariate Analysis

The multivariate logistic regression analysis was applied to see the association of various risk factors with the undernutrition-U2, after eliminating the confounding effect.

Risk of being Underweight and Stunted in U 2 Children

Underweight	Odds ratio
Height of mother < 145 cms	1.965
Mothers with no education	1.812
Mothers who did not have institutional delivery	1.374
Mothers who did not watch television at least once a week	1.355
Households with no toilet facility	1.345
Mothers who experienced emotional violence	1.317
Mothers who did not consume IFA tablets for 90 days or more	1.216
Stunted	
Mothers with no education	1.647
Height of mother < 145 cms	1.643
Mothers who did not have institutional delivery	1.386
Households with low standard of living	1.346
Households with no toilet facility	1.245

The risk factors associated with high prevalence of underweight-U2 are found to be pertaining to the status of mothers viz. height of mother less than 145cms had around double the risk of undernutrition-U2 than the mothers with height more than 145cms, mothers with no education had 1.8 time more risk of having underweight-U2 children than the literate mothers, mothers who did not go for institutional delivery had 1.4 time more risk than the mothers otherwise, mothers who did not have the exposure of watching TV at least once a week had 1.4 time risk than the mothers who watch TV at least once a week, mothers who experienced emotional violence also were at higher risk of having underweight-U2 children, mothers who did not consume IFA tablets for at least 90 days, mothers experiencing emotional violence and mothers living in households with no toilet facility were also at higher risk of having underweight-U2 children.

Regarding prevalence of stunting-U2, mother's with no formal education or mothers who had height < 145 cms. have 1.6 times more risk than the other mothers. Similarly mothers who did not go for institutional delivery were at 1.4 time higher risk of having stunted-U2 children. Mothers who were living in household with no toilet facility or with low standard of living had higher risk of having stunted-U2 children.

4.   Discussion

The findings of this study clearly indicates that interventions for preventing undernutrition in children should accord highest priority to under twos i.e. focus on pregnant women and the first two years of life or the first 1000 days of life. Moreover, care of women must start prior to onset of pregnancy and throughout the life cycle to ensure girls attain their

optimum growth. This implies not only nutrition care of adolescent girls but also actions for discouraging conception below 20 years should be prevented.

It is important to address the immediate causative factors of undernutrition and intensify interventions such as breastfeeding and complementary feeding of children and prevention of infections. Timely introduction of semi-solid food along with continuation of breastfeeding at 6 months, is essential for influencing the nutritional status of children.

Urgent actions are required to ensure mothers start breastfeeding a newborn within an hour of birth and exclusively feed only breast milk to the infant up to 6 months of age. Introduction of water in the first six months to an exclusively breastfed child needs to be discouraged and active effort needs to be directed to explain that the water content of breast milk is adequate. Moreover, a mother needs to know the association of unsafe water fed to a child results in higher frequency of diarrhea and such episodes of diarrhea has serious implications on loss of nutrients, reduction of immunity and precipitation of undernutrition. Additionally, implications of personal hygiene such as washing hands with soap and water after defecation and prior to feeding need to promoted along with efforts to promote appropriate young child feeding, prevention and management of diarrhea and complete routine immunization (RI) and vitamin A supplement for reducing prevalence of undernutrition in young children.

Low status of women in India is observed to be one of the primary causes which adversely influence birth weight as well as nutrition and health status of children. The findings of the study highlight the statistically significant association of undernutrition in children with low birth weight and factors which influence the health, nutrition and social status of women. Investment in improving health and nutritional status of women prior to onset of pregnancy and during pregnancy is critical. Women's decision making ability and being free from emotional violence are critical for appropriate health and supporting environment for care of family and children for preventing undernutrition. Empowered educated women, who have control over their incomes, are more likely to invest in food, nutrition, health and education of needs of their children. Introduction of interventions to improve economic situation of mothers and her decisive power in a family is therefore very important. Additionally, education of women and family members on health and nutrition need to be undertaken regularly through mass media. Similarly health-nutrition education of adolescent population in schools and out of school is critical for prevention of undernutrition.

There is therefore a need to focus on life cycle approach for improving nutritional status of young children (Fig I). In this context, delaying the age of marriage to over 18 years, delaying conception to over 20 years, care of women during pregnancy and prevention of low birth weight are critical. It is important that all newly married couples are registered and informed of measures to be taken at family level so that the women enter pregnancy healthy, nourished and non-anemic.

Figure I: Intergenerational Cycle of Undernutrition[1]

The success factors for reduction of child undernutrition therefore need to ensure that there are adequate and defined comprehensive policies which are not limited to mere provision of food supplements .There is an urgent need to change the mind-set of politicians and policy makers that food insecurity is not the only cause of undernutrition in children. .it is important to address the immediate causes of undernutrition by ensuring over 90% coverage of evidence based direct interventions comprising promotion of appropriate behavioural practices of family regarding infant and child feeding, adoption of personal hygiene practices such as regular washing hands with soap and water, proper care and feeding of children during diarrhea/illness, ,complete routine immunization, six monthly vitamin A supplements, administration, antenatal care during pregnancy including prevention of anemia and ensuring adequate weight gain during pregnancy as well as delaying the onset of pregnancy to over 20 years .Moreover, every pregnancy needs to be tracked for at least the first year of life of a child to ensure direct interventions reach each and every pregnant mother and infant. Additionally, increased focus to follow up and care of low birth weight newborns is critical. Such actions require highest priority to reach and regularly counsel families having any of the following as family members - children below two years, pregnant women, newly married girls or a severely malnourished child.

The above referred direct actions are to a great extent being addressed under the Reproductive Child Health Programme of the National Rural Health Mission and Integrated Child Development Services (ICDS) services in the country. Contacts of health services with mothers and care givers during routine immunization of children and institutional delivery need to be optimally used for institutionalizing counseling of caregivers for adoption of appropriate infant and young child feeding practices and maternal nutritional care practices. It is well documented that focus on first 1000 days of life and over 90% coverage with the evidence based package of selected interventions stated above could reduce undernutrition by at least one-third in the developing country[2,8,9].

In addition to the above direct interventions, there is a need to address the underlying causes of undernutrition which are indirect actions and require long term investments such as improving women's education status and empowering women as well as ensuring food, health and nutrition security of women

Besides prevention, urgent actions are also required to treat children who are suffering from severe acute malnutrition (SAM). The Health Department has issued operational guidelines for management of SAM children treated in institutional set up such as the Nutrition Rehabilitation Centres (NRCs). However, it is also recognized that the care of over 80 percent SAM children is possible at community/family level and Government of India is therefore plans to issue guidelines for appropriate community based care of SAM children.

It is evident for the analysis of association of undernutrition in under twos with various determinants that both direct and indirect interventions need to be effectively implemented by joint efforts of a number of sectors in India such as Health and Family Welfare, ICDS , Women's Development, Education, Water-Sanitation, Agriculture-Horticulture, Public Distribution system/Food and Civil Supplies, Mass Media etc. High political priority and leadership support along with effective social mobilization strategy for involvement of family, community as well as panchayat or local government is essential for addressing undernutrition in children.

5.   Recommendations

The life cycle approach gives various occasions for taking the preventive action. First two years of life is one such occasion. Better breastfeeding and complementary feeding practices increases nutritional status of infants. Community-based nutrition programs, ICDS and other such state specific programmes which may concentrate on latest intervention techniques, such   as behavioral change communication technique to improve upon the breastfeeding and complementary feeding practices, apart from their regular programmes like micronutrient supplementation etc. Intervening at each point in the life cycle will accelerate and consolidate positive change.

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